

# Based Waste Management Innovation Design of Industrial 4.0 in Makassar City

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**Abstract**— Increased adoption of digital technology in various fields throughout the world has become an inevitable phenomenon. This trend is often debated with the Industry 4.0 label. The point that was put forward in this debate was that the Industry 4.0 was a revolution that would reshape developments similar to the previous industrial revolution. In Indonesia, Industry 4.0 has emerged as a discourse on policy-based innovation in various fields of life that aims to institutionalize an innovation system that includes government, business, academia (education), and politics. One of the problems that arises in urban areas is the problem of waste management. To overcome the problem of solid waste in the city of Makassar, an innovative policy design was made which was linked to Making Indonesia 4.0 jargon. Makassar City authorizes Jakstrada, Five Star TPA, and various programs in the Clean Saturday Echo frame.

**Keywords**— innovation policy, urban area problems, waste management, and industrial revolution 4.0

## I. INTRODUCTION

At the Indonesia Industrial Summit 2018, President Jokowi launched the "Making Indonesia 4.0" roadmap. This is a national industrial strategy in the era of industrial revolution 4.0. Without changing governance in government, various innovative efforts continue to be made. With this discourse on Making Indonesia 4.0, the greatest hope that will be addressed is the possibility for every citizen to engage in government, voice their opinions, coordinate their efforts, and even avoid the supervision of public authorities in the unification of the physical, digital and biological world concepts that continue fused [1], [2], [3]. This space offers new technologies and platforms in the implementation of innovative public service programs.

Human activities carried out on a daily basis will influence the increasing volume of waste, which is influenced by many things, one of which is the habit of people littering. Garbage problem is a daily problem that has not been found to the solution. The presence of waste from domestic, commercial and industrial activities cannot be avoided, even more complex and increasing in quantity in line with economic development from time to time [4].

The accumulation of rubbish that occurs will disrupt the activities of the surrounding population, in addition to the unpleasant smell, rubbish is also often infested by flies so that it can bring disease. Waste management with 3P (Collection, Transport and Disposal) is now no longer effective, now a better waste management system is needed so that the accumulation of waste that often occurs in big cities in Indonesia does not happen again.

Makassar City with a population of 1.7 million, produces around 4000 m<sup>3</sup> of waste per day, the volume of waste in Makassar City increases by 200 tons per day, where every month the waste ranges from 600 tons to 800 tons, so that the volume of waste can be predicted in Makassar City is quite high. The city with an area of 177,557 ha, is capable of producing up to 550 tons of waste, or approximately 4,000 cubic meters per day, while the Makassar City Environmental Agency can only handle around 3500m<sup>3</sup> per day. That means, there are around 1000m<sup>3</sup> of waste in Makassar City that is not handled in the community.

The problem of garbage is not a problem that is easily handled by the Makassar City government, in overcoming hygiene problems, the Makassar City Government (Pemkot) issued a policy called "Makassar Tidak Rantasa". Makassar Tidak Rantasa Policy is a policy that regulates the cleanliness of the City starting from the awareness of all residents of Makassar City to prioritize aspects of cleanliness in their daily lives. One approach to the community to be able to help the "Makassar Tidak Rantasa" program is to familiarize people with behavior which is in accordance with the objectives of the program and changes people's perceptions of waste management. Government programs cannot work well if there is no role for the community, the role of the community can be carried out with the awareness of the community itself to bring their waste to the nearest polling station [5], [6], [7].

he form of policies and strategies in waste management is governed by the Regional Regulation of Makassar City Number 36 Year 2018 Third Part Article 4, namely:

- 1) Reduction strategy
- 2) Management strategies

Furthermore, in Article 4, it describes the targets to be achieved, namely:

- 1) Target reduction and handling of 30%
- 2) Target of reducing and handling waste by 70%

**Table 1. Waste Generation Rates in Makassar City in 2018**

No	Kecamatan/ District	Population	Generation rate (Liter / day)
1	Ujung Tanah	48.729	146.187
2	Tallo	137.336	412.007
3	Wajo	35.331	105.992
4	Makassar	82.199	246.567
5	Bontoala	64.331	192.992
6	Mariso	54.222	162.667
7	Mamajang	60.332	180.997
8	Ujung Pandang	28.391	85.174
9	Rappocini	143.519	430.557
10	Pannakukang	133.683	401.049
11	Tamalate	154.381	463.163
12	Manggala	102.103	306.309
13	Tamalaranea	89.776	269.328
14	Bringkanaya	135.469	406.408
Total		1.269.182	3.807.186

Source: Environment of Makassar City

Can be seen in the table. The largest number of waste generation is generated by Tamalate district, which is 463,143 liters / day. While the smallest amount of waste produced by Ujung Pandang District is 85,174 liters / day.

Currently the waste management system in the city of Makassar has been fully delegated to the respective districts, using a general waste management system, namely collection, management, transportation and final disposal [8], [9], and [10].

## II. METHOD

This study uses phenomenological studies using a This research was conducted in Makassar City with the consideration that Makassar has a large population and has problems as the problem of urban areas in other big cities. The type of research used is descriptive research. It aims to reveal facts, circumstances, variable phenomena and circumstances obtained during research and presented objectively.

Based on the title of this research Innovative Policy Design in Waste Management in Makassar City, the focus of the research is the implementation of the waste management innovation policy in the city of Makassar, as stipulated in the Jaksrada and Five Star TPA policy [11] and [12].

Sources of data in this study are divided into two types, namely primary data and secondary data. Primary data is data obtained from interviews, while secondary data is data obtained through observations and documents relating to the focus of research. Data collection techniques were carried out by observation, interview and documentation.

## III. RESULTS AND DISCUSSION

Community participation has an important role in reducing waste that is currently available because it requires an approach to the community by providing opportunities and trust to the community so that the community can contribute fully to waste management.

Based on the results of the study, it was found that

community participation in waste management in the city of Makassar had been done quite well. This can be seen in each aspect, such as:

### A. Community groups

Community groups are two or more people who share identities and interact with each other to achieve common goals. The formation of a social group because of the instincts of humans who always want to live with other people to live together. Joining a group is something that is purely from oneself or by chance. However, to join a group usually individuals see two factors, namely closeness and similarity. The closeness in question is the closer geographical distance between two people, the more likely it is to see each other, talk and socialize, while the similarity factor is the similarity of interests, beliefs, values, intelligence, or other characters.

The existence of members of community groups in Makassar City is one form of concern of the government and the community itself regarding waste, with the presence of members of the waste community group expected to be well managed, creating a clean and healthy environment as well.

Based on the results of the study, it is known that there are community groups in the city of Makassar, namely the Waste Bank Group has not run well enough. This is evidenced by the lack of interest of the people who know the location of the waste bank and the garbage bank exchange system. This community group should be able to attract other people to be involved in it. However, this waste bank group is still less attractive to residents. The lack of forms of supervision carried out by the Makassar City Party is also a factor in the lack of interest of the community to participate in becoming members of this community group.

### B. Group discussion activities

Discussion is a method of solving a problem with a process of thinking in groups or together, while a group is a collection of several people from various groups who become one in carrying out an activity.

Group discussion is a conversation process that involves a group of people and interacts with each other, sharing information, solving problems and making decisions. The purpose of group discussion is to solve a problem through group thinking processes and the benefits of this group discussion activity, namely increasing the ability to think and how to communicate because in the discussion there are interactions with individuals.

Many problems that arise related to waste management require various solutions to solve these problems, one of the steps that can be taken is by conducting a group discussion. This group discussion is one of the ways the community issues its opinions regarding the issues discussed, besides that we can also identify a problem clearly because it involves several people by exchanging ideas, experiences and information so as to produce a problem-solving decision.

Based on the results of the research conducted, it was found that the group discussion activities held by the Makassar City had gone quite well. Nutrition created a clean environment, the Makassar City needed various solutions and inputs from various parties including the community

itself. Therefore, the Makassar City held a group discussion to find the best solution that could be accepted by the community. For this group discussion activity to proceed well, the Makassar City also facilitated from the place to the consumption management.

### *C. Moving Community Resources*

The success of an activity is closely related to community resources, because by using the community's own resources, they are able to work together because they feel they have a responsibility. If you do not have the strategy to drive community resources, it will become a barrier to the success of an activity.

Using community resources to create a clean environment is not easy because not all people want to participate in an activity. For this reason, an effort from the government or the community itself is needed to mobilize community resources.

Based on the results of observations in the field by researchers the efforts made by the City of Makassar in mobilizing community resources have gone well. This can be proven by the existence of communities involved in various activities held by the City of Makassar. Community resources are also closely related to motivation because by giving motivation to the community, the community will be encouraged to carry out an activity.

### *D. Taking Part in the Decision Making Process*

Decision making is a process of selecting the best alternative from several alternatives. In the process of community decision making, it is expected to have an active role so that prescribed decisions can be well received by the community itself. To be able to develop the ability to make the right decisions needed some ability to do it. First, careful consideration is needed by looking at all the factors related to the problem of waste management and any alternative solutions and being able to determine the best solutions that will be implemented smoothly and also required to have broader insights in anticipating the actions and reactions of those who emerge from the community. in the process. The second has a strong character needed to make the best decisions at the right time and tell them clearly to the community appropriately so that the expected results are obtained.

Based on the results of research, community involvement in the decision-making process has gone quite well, the involvement of the community in the process proves that the community still cares about creating a clean environment. Even though there are obstacles during the decision-making process, the activities that have been determined have gone well as expected.

The community involved in the process is expected to be able to contribute more so that the decisions that will be determined will be able to run well as intended.

### *E. Utilizing the results achieved from a community activity*

Waste management is all activities carried out to handle waste from the time it is generated to the final disposal. This waste management activity includes the control of waste generation, garbage collection, management and final disposal. The collected waste can be managed further, both at the location of the waste source and after arriving at the

landfill. The goal is that the waste can be reused, so that it can reduce waste piles and obtain economic value.

Creating a clean environment through the utilization of waste management activities in the city of Makassar is carried out through various methods such as utilizing inorganic waste such as bottles, plastic and used cans which are later changed to something that has economic value.

Based on the results of research conducted on the ground, the activities carried out by the community have been going quite well, it have been carried out by the people of Makassar City are inorganic waste management and community service activities.

### *F. Supporting and Inhibiting Factors of Community Participation in Waste Management in Makassar City*

Population growth in Makassar City is very influential on increasing the amount of waste, the number of activities carried out by the community, the more waste will be generated. The strategy carried out by the Makassar City to increase the people's desire to participate in waste management has been carried out.

Waste management aims to reduce waste that accumulates and increases people's income by recycling inorganic and organic waste into economic value. Community participation needs to be considered because it is the key to the success of the 3R program and to increase community awareness of the environment.

Based on the results of observations of the researchers themselves regarding the factors that become a barrier to community participation in waste management in Makassar City, namely Demographic factors (population). The population in Makassar City is in the first place with a total population. This certainly has an effect on the increase in the volume of waste that is currently available. The government should look broadly at the impact of this population density, therefore the role of the government in overcoming an increase in population is urgently needed.

The provision of support by the City of Makassar to the community needs to be carried out thoroughly, optimally, and sustainably by providing opportunities based on the understanding that the community has the capacity and support, protection, and empowerment that is intensive and sustainable. So that the community is able to increase its role in creating good and environmentally sound waste management.

## **IV. CONCLUSION**

The success of an activity is not only influenced by the rules and legislation issued by the regional government. Touch and participation from the community is one of the effective ways to overcome waste management that is still not effective. Awareness and sense of responsibility for maintaining and caring for the environment are driving factors that must be encouraged in each individual. On a planning scale, uncontrolled waste management from now on will affect the next generation of cities in the future.

Based on the results of research and discussion on community participation in waste management in Makassar City, it can be concluded that community participation in

waste management in Makassar City has been running quite well even though the implementation process still found obstacles which resulted in the community not participating in an activity.

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